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**University of Agribusiness and Rural Development/Bulgaria
University "St. Kliment Ohridski" Faculty of Economics/Republic of North Macedonia
IBANESS**

PROCEEDINGS

Editors

Prof.Dr. Mariana IVANOVA

Prof.Dr. Dimitar NIKOLOSKI

Prof.Dr. Rasim YILMAZ

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Barriers of Circular Economy Implementation in the Hungarian SME's

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Abstract: Over last few years, the concept of Circular Economy has gained significant attention from both researchers and practitioners to achieve sustainable development. However, few studies have been accomplished regarding drivers and barriers to implementing Circular Economy. With this concern, the aim of this study is to identify the implementation level and the barriers that influence the transition to Circular Economy experienced by the Small and Medium Enterprises (SMEs) within Hungary. By approach, both qualitative and quantitative methods were used for a better inference results through questionnaire that was carried out with the SMEs operating in Hungary. In addition, CREFOPORT database used to select and reach out to the target companies. The barriers have been classified into 5 categories based on an extensive review: Financial, Technology & Expertise, Regulatory, Cultural and Market category. The study results reveal that the implementation of Circular Economy practices is in the infant stage in Hungary. Also the lack of consumer interest, high initial capital cost, Strong risk aversion, the current linear system is in place and lack of proper technology are the most pressing barriers.

Key Words: Circular Economy, Hungarian SMEs, Barriers, awareness level

INTRODUCTION

Indeed, the Circular Economy (CE) model entails 3R principles: Reduce, Reuse and Recycle materials. Reduce refers to the minimization of inputs and the consumption of the raw materials, energy and waste generated. Reuse refers to the repeated use of by-products or some parts of items over multiple cycles and in another stage of production. Finally, Recycle suggests the use of post-consumption items and waste materials as a substitution for using virgin materials (Q. Z. Yang, 2014).

In past years, the concept of the CE has become attractive to major companies and policy-makers as a sustainable initiative to tackle the environmental deterioration and the depletion of natural resources. Unlike the traditional model, CE aims to respect the environmental boundaries through the minimization of the use of virgin materials and discharged waste that demonstrates a strong interrelation between the economic and the environment.

The successful uptake of CE initiatives could deliver a wide range of benefits and contributes to value creation for such aspects as environmental, economic and societal spheres (Sehnm, 2018). Regarding the environmental benefits, the CE model aims to fight the severe shortage and the depletion of the natural capital that can be achieved through the integration of the recycling process. At its core, the CE tend to optimize the resource yields whereby the product is designed to last longer as possible.

Besides environmental sustainability, becoming more circular could lead to economic growth and reduce the large gap between the growing demand for raw materials due to the growth of the population and suppliers shortage. Such changes entirely increase revenue by cutting off input costs and the quantity of raw materials used. Indeed, the economic benefits have been increasingly recognised by decision-makers and researchers. In terms of social benefits, the side effects of a positive environment improve human health and well-being. The pointers are the reduction of negative externalities such as pollution, emission of carbon dioxide and the release of toxic substances. Therefore, the ultimate goal of sustainable development is to achieve harmony between a protected environment, economic growth and social equity (Garcés-Ayerbe, 2019).

Although there is widespread of the CE concept among companies, the transition to CE still in a very nascent stage, especially for SMEs that are immersed in unsustainable business models and for the emerging economies (Thayla T. Sousa-Zomera, Exploring the challenges for circular business implementation in manufacturing companies: An empirical investigation of a pay-per use service provider, 2017). Small and Medium Enterprises (SMEs) play a crucial role in this debate since they are the predominant form of companies operating in the market. According to (OECD, 2017), SMEs

represent 95% of companies in the OECD member states. Nevertheless, in the European Union, SMEs make up 99% of all companies (Ormazabal, 2018). Indeed, some research stated that the implementation of new practices that align with CE have generated value for SMEs in terms of accessibility to new markets, saving material costs and create competitive advantages (Matteo Mura, 2019).

Moving toward CE is relatively challenging and requires fundamental changes in several subsystems (Thayla T. SThayla T. Sousa-Zomera, 2018). In fact, there is a huge gap between the theory of CE and its implementation process, in other words, the CE business model is not fully implemented. Several companies have intended to adopt the CE business model but unsuccessful as there are different barriers and challenges that hamper or slow down during their transition. The exploration of the current barriers is required to give insight and support companies to shift towards the new business model. Therefore, this paper aims to explore the main barriers encountered by Hungarian SMEs to implement CE with the following objectives:

- Investigate the extent to which Hungarian SMEs have adopted CE business model
- Identify the barriers related to CE implementation
- Analyse the identified barriers to CE implementation

The remainder of this paper is structured as follows. Section 2 provides a classification of the main barriers to implement CE by SMEs. Section 3 describes the methods and materials used for gathering and analysing data. In section 4, the results are explained and discussed. Finally, the conclusion is drawn in section 5.

2. CATEGORISATION OF BARRIERS

In recent years, several research conducted have identified barriers hampering SMEs to implement CE business models and divided barriers into different categories. (Ana de Jesus, 2018) categorized barriers into *soft* “institutional and social” and *hard* “technical and economic”. However, (Eijk, 2015) opted for a different categorisation in terms of lever such as “design and production”, “logistics”, “consumption”, “recycling and recovery” and “general framework”. In addition (Krichherr, 2018) distinguished between technological, regulatory, market and cultural categories. In this research, the barriers are categorized according to the most frequented in the literature: these are *Financial, Cultural, Market, Regulatory and Technology & Expertise* categories as presented in table 1.

Table 1. Categorised barriers to implementing Circular Economy

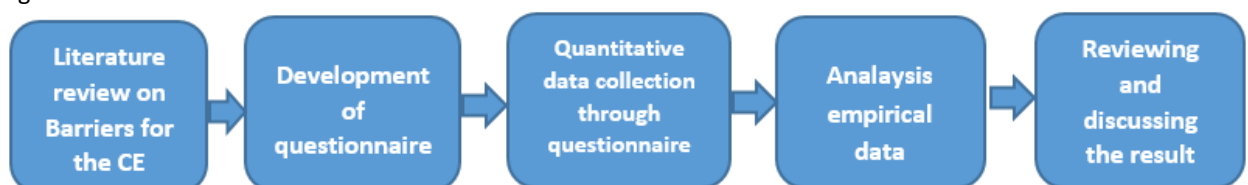
CATEGORIES	TYPE OF BARRIER	BRIEF DESCRIPTION	LITERATURE SOURCES
Financial	High initial capital cost	High upfront costs needed which has a long-term payback period	(Krichherr, 2018)
	Low virgin material prices	Virgin material is often still cheaper than recycled	(Jim Hart et al , 2019)
	High production costs	Potential increase in production cost due to the increase of raw material costs and production process	(Aamon Kisslinga et al, 2019)
	Lack of Competence & Knowledge	Lack of Qualified workers and the know-how to embrace CE solutions	(Vasileios Rizos, 2015)
Technology and Expertise	Lack of information/data	Unavailability of clear guidelines to define sustainability in SMEs and CE principals	(de Sousa Jabbour, Jabbour, Godinho Filho and Roubaud, 2018)
	Lack of proper technology	Inability to deliver high-quality products due inappropriate technology	(Martin Agyemang et al, 2018)

	Lack of effective policies	There is no strict and clear legislative that impose companies to adopt CE	(Jim Hart et al , 2019)
Regulatory	Administrative burden	Complexity of the administrative procedures and the requirements of the environmental legislation	(Vasileios Rizos et al, 2016)
	Lack of governmental incentives	Weak incentives system to stimulate the adoption of CE business models	(Calogirou et al, 2010)
	Strong risk aversion	Difficulties to estimate products performance and the financial forecast discouraging to take risk	
Cultural	Lack of interest on the part of Leaders	Poor management commitment and focusing on short term investment which does not align with CE	(Yong Liu and Yin Bai, 2014)
	Current linear system in place	Companies are already familiar with the Linear system which is deeply rooted and widely established in their current business practices	(A.G. Pheifer, 2017)
	Lack of consumer interest/awareness	Negative perceptions of reused products and unwillingness of consumers to change their lifestyle and buying behaviour	(Yong Geng and Brent Doberstein, 2008)
Market	Difficult to cooperate/collaborate with other companies	Insufficient transparency and weak relationship within the industrial sector to create eco-industrial chains	(Kannan Govindan and Mia Hasanagic, 2018)
	Unpredictability in supply and demand	Limited willingness of suppliers and customers are considered as a discouraging factor	(D.A. Vermunt, 2019)

3. METHODOLOGY

This exploratory study follows a deductive approach. This means the results have been derived using quantitative methods, analysis and based on the interpretation of quantitative research data. The first step consisted of a structured review of the literature, followed by the design of a detailed questionnaire based on the literature. The third step was data collection including the distribution of the questionnaire. Later, data analysis of the returned questionnaires were performed. The steps followed in this research are presented in fig 1:

Figure. 1. Flowchart of research



3.1 Questionnaire design

For this study, the primary data was collected through a questionnaire to explore the degree to which the Hungarian SMEs have implemented the CE and the main barriers they face. The questionnaire was designed using the Lime Survey application with both English and Hungarian language to facilitate data collection. Overall, the questionnaire composed of 15 questions and was categorized into three sections. The first section consisted of demographic questions including the industrial category of the company, company size in terms of employees and respondents position. The second section was aimed to explore the awareness level and the degree of CE implementation among Hungarian SMEs. The questions included the percentage of Reusing or recycling materials and the percentage of Disposal of materials within the company, in addition, basic questions to uncover respondent’s knowledge about CE and its benefits. The third section aimed to find out the barriers to CE implementation, 15 barriers have been selected based on an extensive literature review were divided into 5 categories. For each barrier, the respondents were requested to estimate its significance according to the five-point Likert scale ranging from 1= the lowest level to 5= the highest level.

3.2 Questionnaire distribution

The target respondents in this research involved General Managers, management positions and Head of Environmental Management from various industries in Hungary. To avoid mistrust of the respondents, the questionnaire started off with an explanation of the overall research objectives, ensure that the participation is voluntary and promised that all responses will be treated with confidentiality. The contact person for each company was obtained from two different sources. The first source is the CREFOPORT database (the online database of companies in Hungary) while the second source consisted of the social networking site LinkedIn. We used some specific conditions and filters in CREFOPORT to get a heterogeneous sample composition. For instance, the selection of different *Regions* and *Industrial sector* of the companies within Hungary, *Number of employees* between 0-250 employees and the *Active* companies.

The questionnaire was sent by email to 1300 companies, 76 questionnaires were returned consisting of 16 uncompleted responses and 60 ones completed which represented the final sample size for this research. Thus, the effective response rate was 9.5%. In addition, the questionnaire was available for completion from 1st of March 2021 to 30 of April 2021. Due to the exploratory character of the research findings, we used SPSS to analyze the questionnaire data and the results were presented through descriptive statistics.

The WEIGHTED MEAN method was employed to evaluate the influence of each barrier. This approach is widely used in the industrial sector and serves as a support for decision-making problems.

There are five steps for applying WEIGHTED MEAN method: (1) Selecting and categorizing barriers from the literature review, (2) Designing the questionnaire (3) Distrusting and collecting data, (4) Calculating weighted mean for each barrier, (5) Ranking the barriers and interpreting results.

Step 1: Developing the Linguistic Scales

The first step consisted of the development of the linguistic scale. The respondents completed the evaluation according to their experience and knowledge. The Weighed Mean was transformed into a descriptive equivalent: Rating Scale: Highest range- Lowest range/ Highest range = $5-1/5 = 0.8$

We proposed the following five-point Likert scale:

Table 2. Weighted Mean Linguistic scale

Scale value	Range	Descriptive Equivalent
1	[1 - 1.8]	No influence
2	[1.8 – 2.6]	Very low influence
3	[2.6 – 3.4]	Low influence
4	[3.4 – 4.2]	High influence

5

[4.2 - 5]

Very high influence

Step 2: Formulate a normalized Weighted mean matrix

The normalized Weighted mean matrix was obtained as follows:

$$\bar{x} = \sum_{i=1}^N w_i x_i$$

Where \bar{x} = the weighted mean barrier
 w_i = the allocated weighted value
 x_i = the observed value

It was assumed that all barriers has equal importance.

Step 3: Calculate the Weighted mean of each barrier

The Weighted mean of each barrier is calculated using the equations in step 2. The barriers are ranked from the highest to lowest influence according to the weights of barriers. The results, weighted mean and rankings are summarized in Table 6.

3.3 Respondent’s Profile

The profile of respondents represents a heterogeneous sample as it summarized in Table 3. The greater portion of the respondents were holding managerial roles 51.67% followed by General Manager 13.33% and only 10% were acting as a Head of Environmental Management. In terms of industrial sector, around 18% of the respondents were from the mechanical and electrical engineering followed by chemical industries were 16%; food, beverages, tobacco industry were 15% whereas were 10% from other sectors. Regarding number of employees, 36% of the companies employed between 100-250 employees, 28% employed between 50-99 employees and 21% employed 10-49 employees. The remaining were between 0-9 employees.

Table 3. Demographic profile of the respondents

Demographic information	Number of Respondents	Percentage of respondents
Position		
General Manager	08	13.33%
Management positions and related	31	51.67%
Head of Environmental Management	06	10.00%
Other area of the company	15	25.00%
Sector		
Mechanical and electrical engineering	11	18.33%
Food, beverages and tobacco industry	09	15.00%
Chemical industries	10	16.67%
Mining		
Construction industries	03	5.00%
Forestry, wood and paper	05	8.33%
Oil & Gas industry	06	10.00%
Agriculture, plantations and rural sector	03	5.00%
Financial services and consultancy	04	6.67%
Other	06	10.00%
Number of employees		
0-9 employees	08	13.33%
10-49 employees	13	21.67%
50-99 employees	17	28.33%
100-250 employees	22	36.67%

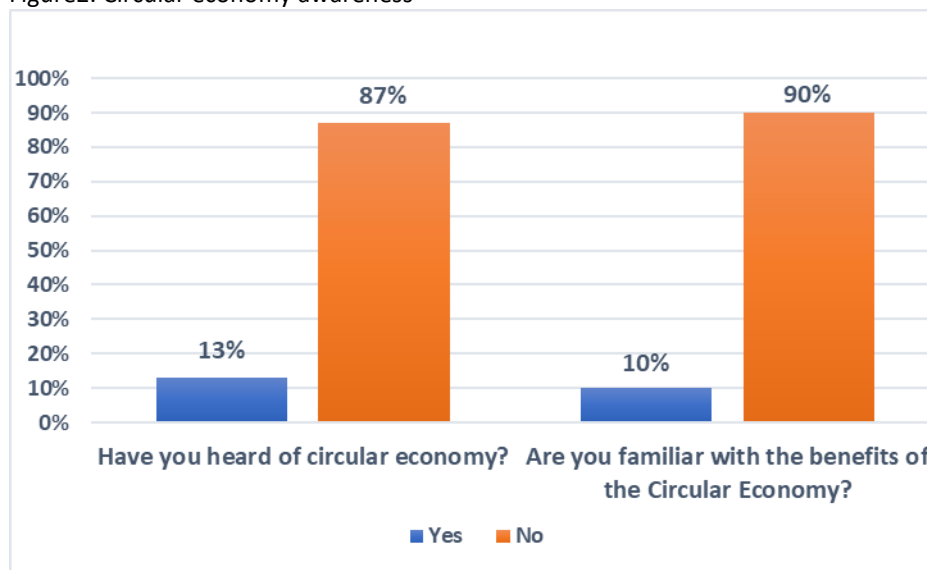
4. RESULTS & DISCUSSION

The following section presents the results of the questionnaire, which is subdivided into three aspects: 1/ how participants perceive CE, 2/ Examination of the implementation level of CE, 3/ Exploring company's behavior. Finally, analyzing the barriers to CE adoption resulting from the questionnaire.

4.1 Circular Economy awareness

Initially, respondents we asked about their knowledge concerning the CE and its benefits. The results have shown that only 18% of the respondents had heard of the CE and chose the answer "Yes" while the remaining 82% did not. When we asked the respondents whether they are aware of CE benefits, about 78% have chosen the option "No". This result revealed a low level of awareness and lack of understanding around CE within companies. There is a clear strategy to provide appropriate capacity trainings and for those businesses in order to improve their awareness on the benefits of CE.

Figure2. Circular economy awareness



4.2 Implementation Level of Circular Economy

Adopting a Circular Economy business model is a challenge for SMEs. To explore the current implementation status, the respondents were asked to select one of the following alternatives: Already implemented, planned for the next 2 years or not implemented. The findings were that 86% of the respondents stated that their companies did not either implement CE practices or planned for the next 2 years. The companies are not ready yet, 11.67% of the respondents answered that their companies intend to implement it over the next 2 years. However, 8.33% acknowledged that CE already is adopted.

There is another aspect to evaluate the CE status in Hungary. The respondents we asked whether their companies cooperate with other companies to create an eco-industrial chains. The Majority, 90%, stated that there is lack of cooperation between companies to guarantee the creation of an eco-industrial chain.

Figure 3. Implementation Level of Circular Economy

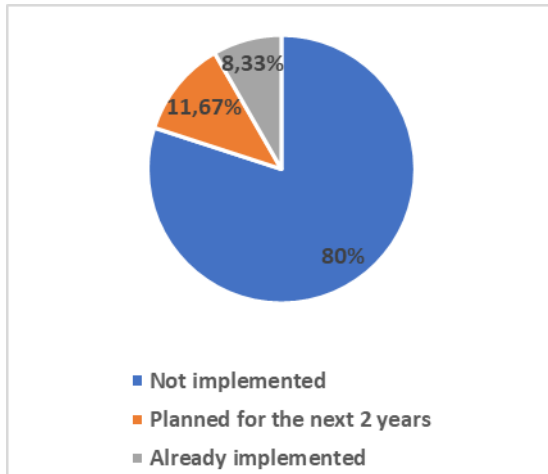
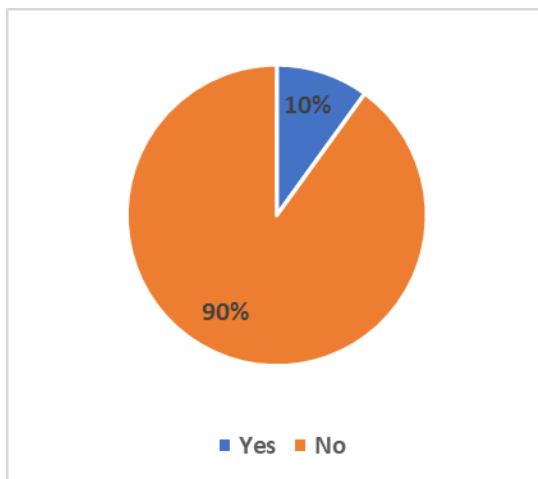


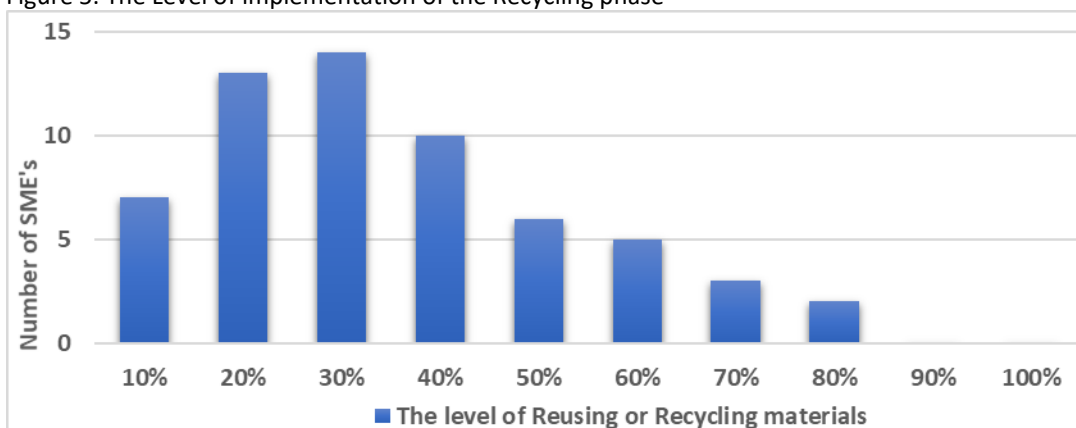
Figure 4. Cooperate Level between companies to create eco-industrial chains



4.3 The behavior of companies towards Circular Economy

Regarding companies' behavior in connection with CE practices, respondents we asked to assess the percentage of recycling materials. However, the results indicated that the wasted materials rate is very high. Over 50% of respondents stated that the recycled materials rate does not exceed 40% and the remaining represents the disposal rate.

Figure 5. The Level of implementation of the Recycling phase



4.4 Barriers for the Circular Economy

The identified perceived barriers by the questionnaire respondents for implementing Circular Economy practices are illustrated in Table 2 based on their relevance.

4.4.1 Financial barriers

This category comprises the most salient barriers receiving the highest weights. The high upfront costs in any industrial sector, which are required to adopt CE practices, were perceived as major obstacles in this category and comes fifth among all categories. Moreover, companies anticipate a long pay-back period, especially for SMEs with short-term visions. Under this barrier, there are also indirect costs for hiring employees with higher expertise and arranging training for them. The "low virgin material costs" appears as the sixth most influencing barrier, (Felix Preston, 2012) Claimed that in many cases, the recycling of materials is uneconomical compared to the production of virgin materials.

The "high production costs" perceived is as the seventh barrier on its weight. This is due to the augmentation of recycling costs and wages also purchasing sophisticated machines. Thus, the profits will be decreased and companies were not willing to incur as their sole goal is striving to reduce production costs.

4.4.2 Technology and Expertise barriers

The possession of proper technology and the relevant expertise is prerequisite to implement CE. However, this category is identified as the bottleneck because it is not fulfilled yet by most companies. In contrast, the Lack of Competences & Knowledge barrier ranked as the ninth most pressing barriers includes the gap in workers in terms of detailed technical skills and the ability to design, deal with remanufactured products. The lack of data about the economic and environmental benefits has been classified in twelfth rank. Comparatively, this barrier has lower influence compared to the barriers and the respondents could access to this information.

Regarding the Lack of proper technology barrier, it emerged as the highest pressuring barrier where the existing technologies and machines are inappropriate to meet the CE expectations. Hence, companies should invest in high-grade technology that can improve the opportunity to deliver high-quality products and to integrate in eco-supply chains.

4.4.3 Regulatory barriers

Generally, government plays a crucial role for SMEs to embrace CE practices. Hopefully, such government intervention are needed to change SMEs vision towards environmental aspects. Indeed, the regulatory category consisted of three barriers; the most influencing regulatory barrier is "Lack of government incentives" which ranks eight out of the 15 barriers. The latter barrier includes the lack of special benefits to the companies that intend to adopt CE initiatives. These benefits could be in form of fiscal exemption or effective taxation system as well as opportunities for funding. In addition, the government should set up conferences to promote and discuss the importance of the CE practices with the manufacturers.

Usually, moving towards CE is a long and complex procedure for SMEs. Additionally, SMEs are required to meet certain standards and obtaining certificates. This administrative burden appears as the ninth barrier among all barriers in our questionnaire. From legislative perspective, Hungarian policy does not create a unified platform to promote the CE. Moreover, the current policy discourages companies in terms of taxation system, import duty for the recycled materials. Thus, companies prefer to use virgin material rather than the recycled as they are comparatively cheaper. The Lack of effective policies perceived is the eleventh rank. Overcoming this barrier means that, the Hungarian government should provide a strict legislative system imposing the integration of CE practices into their operation system.

4.4.4 Cultural barriers

The cultural barriers category concerns the decision-makers and manager's behavior as well as their willingness to embrace CE practices. Indeed, this category comprised the following barriers. Strong risk aversion associated to the implementation of CE. This is due to the complexity to evaluate its benefits and estimate the implementation costs. Even as some managers have positive perception towards CE, this difficulty to anticipate the concrete benefits hinder its adoption. The latter barrier is widely recognized and has been ranked as the second most pressing among all barriers. Lack Leaders' of interest refers to their mindset, which does not favor the environmental concern. The finding reveals that this barrier has low influence and the respondents showed their positive perception and interest.

The "current linear system in place" indicates that companies are already familiar with the current linear system, which is deeply rooted and widely established in their business practices. In addition, to change the attitudes of the workers, companies may motivate them to become aware of the new practices. The result revealed that this barrier has a very high influence and ranks fourth.

4.4.5 Market barriers

In CE implementation, the market barriers are considered as the major constraints. This category includes the Lack of consumer interest and awareness' which represents the second greatest barriers. The latter barrier explains the unawareness of customers of durable products and their crucial role to attain the environmental sustainability. This could be explained by customer's interests where the cost of products is more important than their impacts on the environment. Thus, customers are not willing to buy durable products, which is generally more expensive. The adoption of CE requires a fundamental change in customer's behavior and lifestyle. In relation to the willingness of companies to engage in the value chain, this barrier has been identified as the least pressing barrier. This explains the willingness of the respondents to collaborate with other stakeholders to create a value chain and enhance business relationship. The successful transition to CE necessitates a high appreciation level of circular products from the customers. This could generate high market demand then profits as well. However, the limited awareness of customers makes the unpredictability in supply and demand more difficult for the companies. The respondents perceive that this barrier has the lowest influence.

Table 4. Circular economy barriers – questionnaire results

Barriers		Rating Scale Frequency					Overall			
		1	2	3	4	5	ST DEV	WEIGHED MEAN	RANK	DE
FINANCIAL	FB 1	0	1	13	17	29	0.85	4.23	05	Very High Influence
	FB 2	0	2	14	23	21	0.85	4.05	06	High Influence
	FB 3	0	5	17	27	11	0.86	3.73	07	High Influence
TECHNOLOGY	TB 4	3	4	19	19	15	1.09	3.65	09	High Influence
	TB 5	3	10	19	19	9	1.09	3.35	12	Low Influence
	TB 6	0	1	8	23	21	0.77	4.3	01	Very High Influence
REGULATORY	RB 7	2	8	13	21	16	1.11	3.38	11	Low influence
	RB 8	3	5	15	24	23	1.07	3.65	09	High Influence

	RB 9	1	8	20	12	19	1.11	3.67	08	High Influence
CULTURAL	CB 10	1	2	6	21	30	0.90	4.28	02	Very High Influence
	CB 11	4	8	22	17	9	1.10	3.32	13	Low Influence
	CB 12	0	1	9	24	26	0.77	4.25	04	Very High Influence
MARKET	MB 13	0	1	8	24	27	0.76	4.28	02	Very High Influence
	MB 14	4	10	19	17	10	1.14	3.32	13	Low Influence
	MB 15	2	10	24	15	9	1.03	3.32	13	Low Influence

CONCLUSION

This study aimed to provide an indication of the awareness levels of the CE practices among Hungarian SMEs, to identify the perceived barriers their influence on implementation. From the literature review, 15 barriers were selected and categorized as five main sub-barriers. These barriers have been ranked using the Weighted Mean method, which helps decision makers to know the influence of them. The research findings reveal that the majority of the questionnaire respondents were slightly aware of the CE and its benefits. The CE transition is unlikely to be successful with the lack of global consensus and awareness about the CE concept at the individual level in the company. In addition, the results have highlighted that the CE implementation is at an early stage in Hungary. Majority of the companies do not cooperate in the eco-industrial chains and also the recycling process still not integrated yet in their production chain.

In summary, the main findings highlight three different influence level of barriers:

- **Very high influence:** The 'Lack of proper technology' emerged as the most significant barrier due to the inadequacy of the existing technology to the circular products, followed by the 'Lack of consumer interest' in the circular economy products and the 'strong risk aversion' associated with the new practices. In addition, this level comprised the 'Current linear system in place' barrier that indicates to what extent the linear system is rooted and the 'High initial capital cost' required to invest in new technologies.
- **High influence:** This category includes the 'Low price of virgin materials' assuming that the virgin materials still cheaper than the recycling. Subsequently, 'High production costs' resulting from the increment of wages (hiring higher skilled employees) and recycling process, followed by the 'Lack of governmental incentives' unlike other governments that have heavily invested and supported SME's. Moreover, the 'Lack of knowledge and competence' and the 'Administrative burden' are barriers that have been perceived by the respondents with the same influence. Several companies do not have the technical capacity in terms of knowledge and skills to invest in advanced technology, so they prioritize the existed technology.
- **Low influence:** 'Lack of effective policies' demonstrates the limited involvement of the Hungarian government to take initiatives for a better economy. This could be improved through imposing strict policies to push the companies to evolve their supply chain. The 'Lack of Data' also perceived as a barrier with low influence with explains the accessibility to the CE information. Finally, 'Lack of Leaders' interest' and 'Difficult to cooperate/collaborate with other companies' are barriers with lowest influence level.

Admittedly, our research has some limitations that should be improved in future studies:

- Limited sample size (60 respondents) affects the generalizability of the results, so we cannot assume the findings are strictly representative.

- The study explored only the awareness level and barriers; other aspects like drivers, practices and suggestions to overcome the barriers should be taken for future research.
- The quantitative data relied on only one method Weighted Mean. In future research, more complex statistical methods should be used.

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